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System for accessing an internet network via a telecommunications satellite

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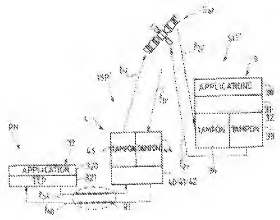
Abstract of FR2778804 (A1)



The system involves distributing the transport layer TCP into two half-modules (31-32,40-42) disposed at the ends of the spatial segment, with the transmission in this segment is effected by a proprietary internal protocol. These half-modules have specific interfaces.- DETAILED DESCRIPTION - The system has a network with a terrestrial segment (RI) and a spatial segment having a bi-directional data link (I1,i2) by a telecommunication satellite (Sat), which is linked with the user's terminal (SIT). The two segments are interconnected by a second information system called an internet service provider (ISP).The transmissions are associated with a stack of protocol layers, each layer communicating with the immediately upper and lower layers by interfaces. The stack has a logical applications layer (30), a first intermediate layer which is immediately below called transport layer of the TCP type, and a second infermediate layer called addressage of the IP network type. The procedure includes distribution of the TCP layer of each user terminal into two half-modules so that each has a TCP transport layer and a specific interface layer (32), and implanting the half-modules at the ends of the spatial segment, with a first half-module being implanted in the ISP and the other in the user terminal. The next step involves the transfer of the addressage network layer IP relative to the user terminal in the ISP system, and the transmission of data on the bi-directional link using the internal transport protocol based on the transmission mode of the specific data. The next step includes the bi-directional conversion between the Internet protocol and the internal protocol by the specific layer (40,32) of the first and second half-modules, and the establishment of an interface between the transport layer (31) of the second half-module and a logical applications layer (30) implanted in the user terminal

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Notice

Description FR2778804

METHOD OF ACCESS TO A NETWORK TYPE VIA INTERNET

SATELLITE TELECOMMUNICATION AND ARCHITECTURE

FOR THE IMPLEMENTATION OF SUCH A PROCESS

The present invention relates to a method for accessing a network such as the Internet via a satellite transmission

data.

The invention also relates to a system for the implementation of this process.

Recent years have seen a very significant development of communications via satellites

telecommunication.

Advances in technology have led to a significant miniaturization of 10 terminal communication, including the realization of portable terminals.

On the other hand, there has also been an expansion as important and fast Internet which are connected at the moment millions of ordinateurs15 of all types and powers.

A user connected to the network can have access to resources

very large scattered across the globe, including databases of very different kinds.

In the context of the invention, the term "Iinternet" should be understood in a broad sense: it includes the "Internet" network itself but also networks called "intranet" or "extranet" generally all networks which transmissions are carried out under the

protocols which will be summarized below, par25 example "TCP" (for "Transfer Control Protocol")

Generally, access to the Internet is done through a service provider or "ISP" (Internet Service Provider "), according to the Anglo-Saxon terminology commonly used.

In the case of large

entities, such as some large companies or universities, coupled with the network is straightforward and is obtained via specialized servers that highlight relation5 internal networks, eg intranet type with the Internet.

The need was therefore felt to quickly combine these two areas, that is to say, to make it possible

access to the Internet via telecommunication satellites of 10.

Figure 1, attached to this description illustrates an example of the general architecture of a system

transmission allowing a terminal of an end user SIT U to access a computer system remote hôte15 HR through the Internet network RI, on the one hand, and via a satellite link, on the other hand.

SIT terminal includes a computer system and transceiver circuits conventional, the

general reference 20.

Part transceiver assembly 20 DE20 is coupled to a transmit-receive antenna pointed at a satellite 21 of remote

munication Sat.

The data transmitted and / or received borrow one bidirectional transmission link 12, ground - satellite.

Similarly, the service provider ISP est25 equipped with a computer and transceiver circuits conventional, general reference 10.

The part of the transceiver unit 10 is coupled to a transmit-receive antenna 11 pointing to a telecommunications satellite Sat.

The assembly 10 communicates with satellite LE30 Sat through a bidirectional transmission link 11 Earth - satellite via the antenna 11.

Internet connection to the grid RI is symbolized by a transmission link bidirectional 12.

Finally, the system includes RH hurry away un35 computer system 30.

Coupling to the internet network RI is represented by a transmission link

bi 61.

The major difficulty caused by such data, HR SIT is essentially linked to the land part connections - satellite - earth, that is to say the space segment; connections 11 and 12.

Indeed, the usual protocols used for communications within a network such as the Internet, including the "TCP" above, are not optimized for accès10 via a satellite telecommunicabons.

This protocol makes these transmissions uncompetitive compared

terrestrial broadband transmissions under development, which will be available in the near future.

Although the "TCP" has been developed to meet acceptable manner, the needs that are felt on a wide variety of networks, it already operates

not all the possibilities of some sub-networks such as the Internet.

In particular, "TCP" provide very poor performance on networks that are characterized by a significant delay and

high bandwidth networks, often called "high-capacity networks" or "Long Fat Networks" ("LFNs"), according to the Anglo-Saxon terminology.

The major problem resulting limits the data rate imposed by the dimensions of what is called "variable window" or "sliding window" according to the Anglo-Saxon terminology and also ineffective treatment segments lost on the high-capacity links.

Les30 options "TCP", which are standard features to improve the performance of the original protocol are

often insufficient to fully resolve these problems.

Networks to delay important, "TCP" has significant limitations during the connection establishment procedure called three times ("three-way connection establishment").

This procedure involves the exchange of three packets "TCP", which are both necessary and sufficient to synchronize the opening of the connection.

For the transmission of each packet, the sending host must wait for the reception of the previous packet returned by the other end of the link.

in

high capacity networks or "LFNs" above, this time entraine10 connection opening very long.

Mechanism called "slow start", for its part, although very useful for internet transactions can seriously limit the flow when it applies to routes of transmission propagation time and higher bandwidth to 15.

This mechanism is to send packets in a low rate at the beginning of the connection and to test if there is congestion on the network.

If the connection is not congested, then the transmission rate is increased continuously until it reaches steady un20.

The process of testing the state of the network depends on the propagation time on the routes.

It follows

that for a network type "LFNs" unencumbered above, a very long time is required to reach the steady state.

Again, the implication is that the large bande25 network bandwidth is underutilized because it emits low amounts of packets for too long.

These problems are very acute with respect to access to the Internet via a transmission link by satellite.

Est30 it particularly necessary to find a solution to the problem of propagation time high.

Indeed, if we consider a geostationary satellite, the propagation time of an electromagnetic wave between a ground station and a satellite, or vice versa, is of the order of 125 ms.

A complete return aller35 and therefore requires a time interval of 0.5 s.

It should be noted that these delays were not high

been considered in the original design of communication protocols on the Internet.

Referring back to Figure 1, it is easy to see a connection between a user terminal and a remote host SIT HR includes a satellite uplink earth-satellite-earth, 12 and 11, characterized by a relatively bandwidth wide and, as noted above, a transmission delay important.

It also includes a series of standardized backhaul, normally at lower transmission delays, but are more sensitive to packet loss or alteration.

Backhaul are often characterized by a relatively low rate and are also prone to loss of sequences.

Indeed, according to the "TCP", the data packets are arranged in sequences transmitted by different routes (routing) and they arrive at their destination in a random order.

The entire message must be reordered

to be restored in its original form.

The result is that the user connecting host - resulting in major delays in transmission, low

data rate, and a transmission path having the loss of data and sequencing.

To summarize what has been pointed out, there is the connection between an end user and a remote host takes successively two types of networks,

transmission characteristics significantly different even if a common communication protocol is implemented.

We also note that we do not enjoy des30 benefits specific to each of these networks, but it combines especially their deficiencies.

The invention aims to overcome the drawbacks of the prior art for access to a network such as Internet via at least one telecommunication satellite link OE35, while maintaining compatibility with full end to end protocol characteristics

"TCP", which is fundamental to Internet architecture.

To this end, the invention provides a method for decoupling the network part including satellite telecommunication links between

user and a service provider (space segment), on the one hand, of the part of conventional terrestrial network Internet, between the same service provider and 10 a remote host, of the other part.

In general, the architecture of communication networks is described by various layers.

For example, the standard "OSI" ("Open System Interconnection") defined by 1 "ISO" has seven layers that will des15 known as lower layers (eg layer "physical" for the physical transmission medium) layers to said high (for example the application layer called "), through intermediate layers, including the layer" transport ".

Donnée20 layer provides services to the layer immediately above and requires the layer that immediately

than other services via appropriate interfaces.

They communicate using the primitives.

They can also contact layers même25 level.

In some architectures, either of these layers may be absent.

In an Internet environment, the layers are five in number, and more precisely, ranging from the upper layer to the lower layer, elles30 include: the application layer ("http", "ftp", "e- mail ", etc...), transport layer (" TCP "), the layer

network address ("IP"), the data link layer ("PPP", "Slip", etc...) and the physical layer.

As part of the process of the invention, the above concerns mainly the decoupling layer called "transport".

The module "TCP / IP" used by the subscriber's terminal, usually consisting of two superimposed layers of software is replaced by a specific module to the invention.

A module of this type is also included in the installation of the service provider at its end in communication with the satellite.

It is the same layer network address "IP."

In other words, the module "TCP / IP" of a terminal according to the prior art is divided into two parts disposed on either side of the satellite link of10 telecommunications.

For cons, the upper layer of "application" is stored in

each user terminal.

This architecture allows to maintain full compatibility with the Internet environment, while abolishing the traditional limitations encountered when implementing the protocol "TCP" on networks

capacity.

In a preferred embodiment, the method according to the invention uses a procedure of acknowledgment of the type called "negative", instead of a conventional acquisition procedure, that is to say type "positive" for links between specific modules, that is to say on the connections between the terminal of the user and the service provider, le25 via satellite.

This procedure is to report only receptions missing data,

within a predetermined time interval, instead of reporting correct reception each, which leads to a waste of time.

Still according to a preferred embodiment, it uses a mechanism that can be called a "decoy" or "spoofing" according to Anglo-Saxon terminology.

This technique overcomes the limit of speed due to the small size of the windows above variables.

Cette35 technique is best used with the technique of negative acknowledgment section used on the earth - satellite - earth.

The service, specifically the half-specific module when the remote host receives the data, it sends an acknowledgment receipt of5 "artificial", without waiting for an acknowledgment which should be provided, as c ' in the case of a

standard architecture, the end-user terminal, which accelerates strongly the exchange process.

Finally, according to one preferred embodiment of the method of the invention, the specific module of the invention is transparent vis-à-vis other protocols used on networks such as the Internet, including a protocol known as acronym "UDP" for "User Data Protocol".

Indeed, this particular protocol pas15 suffers the same limitations as the "TCP".

It is, in particular, much less sensitive to delay

rates presented by telecommunications satellite links.

The invention therefore relates to a method for transmitting data between at least one user terminal and a first computer system said remote host, such as the Internet protocol in, via a network including a ground segment and less space segment consists of a bidirectional satellite liaison25 telecommunications, which is connected to said terminal, said segments being interconnected space and ground by a second computer system said service provider, characterized in that, the transmission being associated one A30 stack of protocol layers, each layer by contacting interfaces with the layers which are immediately above and below, and said stack comprising at least an upper layer of software applications, a first intermediate couche35 immediately below, said transmission, type "TCP", and a second intermediate layer, said addressing network "IP" type, the method comprises: - the allocation of said layer "TCP" of each user terminal in two half modules so as to they each comprise a transport layer "TCP" and a specific interface layer, - the location of one of said half-modules at the ends of said space segment, a first half-module being located in said computer system provider service and a second half-module being installed in the user terminal, - the extension of the layer network address "IP" on the user terminal in the computer system of the service provider, - the transmission of data on said bidirectional link by using a transport protocol based on internal transmission mode specific data, - the bidirectional conversion between said Internet type protocol and said internal protocol specific layer by said first and second half modules, and the realization of an interface between said transport layer of the second half-module and a layer

software applications implemented in the user terminal25.

The invention also relates to an architecture for the implementation of this process cairre.

The invention will be better understood and other features and advantages will become apparent from reading

the following description, with reference to the accompanying drawings, in which:

- Figure 1 schematically illustrates the chain of transmission between an end-user device and a remote host through a telecommunications satellite and terrestrial network data transmission over Internet Protocol, according to the prior art - the Figure 2 shows the same channel by highlighting the software layers involved in data transmission - Figures 3a and 3b schematically illustrate an example of data transmission chain by implementing the inventive method and system architecture10 corresponding - 4 illustrates schematically a variant of this architecture - and 5 schematically illustrates a system architecture for the transmission of data in

two different Internet protocols.

Before describing the method of access to a network such as the Internet according to the invention, via a satellite

telecommunications, we will first define the architecture of a system according to the prior art, a point of view DE20 interaction of the main software layers, with reference to Figure 2.

For the figure 2, and the following figures, elements or circuits identical or at least similar to those in Figure 1 have the same

references, and they will not be described again as needed.

In this figure 2, to fix ideas, shows only two end users Ua and Ub, and Sita and their terminals SITE. Systèma30 components associated with those users are referenced supplemented by the letters a and b, respectively, but

are, a priori, functionally identical.

We will describe the architecture of one of the two terminals, the terminal of the user Ua. This includes, in addition to equipment and circuits described above, referenced 22a software modules which decompose according to the software layers: - a lower layer 224a, known as driver ("driver") or satellite network manager - a first interlayer network address "IP" 223a - a second intermediate layer of "transport", split into two layers at the same level: a layer for the "TCP" 221 and a layer for the protocol "UDP" 222a;

- And an upper layer application 220a.

SITB the terminal has the same architecture, and it is unnecessary to describe its components, which are referenced in the same way, with the exception of the final letter b.

Internet protocols, including the two aforementioned protocols are well known per se and standardized.

We consider initially the only "TCP", which presents limitations that have been recalled when implemented in a broadband network and transmission delays, as is the case for a link satellite

Le25 "TCP" now obeys the standard "IPV4" (version 4 of the protocol).

As has been noted, the number of subscribers connected to the Internet is growing very fast

But according to the protocol address "IPV4" only four bytes, or 232 addresses theoretical, but in reality much less because of the hierarchical structure of the Internet architecture organized into domains

Projections for the near future (years 2005-2011) are feared a shortage of addresses

As early as 1995, recommendations were made to adopt a new protocol ("IPV6) and have been published (work groups" Internet Engineering Task Force "and" IPng "for" Internet Protocol new generation ").

This

new version of "TCP" allows, in particular, a much larger number of addresses available, mais5 also brings other improvements.

A user terminal, such as terminal Sita, therefore communicates with what will be called hereafter the "sub-satellite network", which includes bidirectional links Ia and 12a (IIb and 12b for SITB) and circuits internal and Sat satellites, as described below, the 131 included in the pilot system

13 IT service provider ISP.

The main function assigned to the computer system of the service provider ISP is routing data sent to a subscriber (in the sense host - subscriber) or, alternatively sent to a host system (in the sense subscriber - host).

It can of course also this basic function, perform other functions, such as temporary data storage (fonction20 "mailbox, etc...), But include, in all cases at least the following software layers: - two lower layers consist of drivers: a first driver 131, the side "subnet satellite", during the forming of the driver 224a (or 224b) of the terminal 22a25 (or 22b), and a second driver, 132, the network side terrestrial Internet RI;

- And a layer of network addressing "IP" 130.

More accurately, the service communicates to the driver 132, with the Internet via a main artery RI 12, commonly called

"Backbone," the Anglo-Saxon terminology.

The same remote host HR can be connected to the Internet through a main artery RI, a telephone connection to a switched network standard, a transmission link type "ISDN" ("Integrating Digital Network

Service ") or through another service provider (not shown).

The connection is represented by a bidirectional bus 61.

A priori, the transmissions are done by a "client-server", the various terminals being

"Client" the "server" constituted by the remote host HR.

These reminders are made, we will now be described with reference to FIG 3a, an embodiment of a

architecture for implementing the method according to the invention.

In this figure 3a, we considered only the case of "TCP".

The application of the method of the invention

another Internet protocol, including protocol "UDP", 15 will be described below in connection with Figure 5.

According to an important feature of the invention, a coupling is made between the "subnet satellite" (space segment) and the rest of the Internet, that is to say, the classic land part of this network.

To do this, the lower software layers and intermediate previously residing in end user terminals (only one, SIT 'was shown in Figure 3a) were "broken" into two parts.

A first part 31-32, is located in the user terminal SIT, and second

section 40-41, is located in the computer system of the service provider ISP.

The lower layers, 40 and 32 respectively, play a similar role to drivers 131 and 224 (a or b) prior art.

However, they are specific, as they forment30 the interface between physical media (links 11 and 12), the same characteristics as those of the prior art (FIGS. 1 and 2) and half-modules constituting the layers of specific transport the invention, 41 and 31.

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service provider ISP and a driver 53, playing a similar role otherwise identical to the 132 pilot prior art (FIG. 2).

Layers "IP" module 42 4 and 54 5 gateway communicate with each other via a bus

Bidirectional 420, forming a physical medium, and any conventional drivers (not shown) located on either side of the bus 420.

Result of the provisions which have been recalled, compatibility with the Internet environment

remains intact, the end to end.

Indeed, the virtual architecture of the system according to the invention can be summarized by the one shown in Figure 3b.

Specifications terrestrial Internet, that is to say, the path from the host

HR away via the connection 61, the Internet itself RI and the main artery 12 remain unchanged.

These components have been shown in solid lines in Figure 3b LA20.

It is the same layer applications SIT terminal 30 '.

For cons, the communication path between these two sets of components can be represented simply by a virtual driver 224 'seen by réseau26 land and intermediate layers virtual network address "IP" and "TCP".

There is therefore the compatibility of conservation throughout, this two-way communication naturally.

The protocol conversions are performed by the two half-30 modules specific to the invention (layers 31 and 41) at both ends of the chain of transmission through space.

Between these two modules, 31 and 41, and through specific drivers, 32 and 40, the transmissions of data and control signals takes place according to a specific mode,

based on the forward and reverse links.

Linking the direction ISP'-SIT '(or go) uses a protocolede internal transport, so-called "owner", preferably based on a standard widely used for broadcast transmissions of digital video signals known by the acronym "DVB- S "(for" Digital Video Broadcasting "type S).

This standard is described, for example, in the following document: "Digital Broadcasting10 Systems for Television, Sound and Data Services; Frame Structure, Channel Coding and Modulation for 11/12 GHz

Satellite Services ", ETS 300 421," European Telecommunications Standards Institute. "

For connection-ISP SIT' a technique very similar to that which has been recalled can also

be retained profit.

The physical layer of such bonds is characterized by the virtual absence of errors regarding data transfers.

It includes alsément20 a mechanism based on the accumulation of receipts and use windows variables, mechanism

implemented by the "TCP", becomes ineffective and useless, if this type of connection is implemented.

In addition, issues related to the sequencing of packets losses are nonexistent on the satellite links.

Mechanisms of heavy re-sequencing

may be omitted.

In summary, the "transport" protocol internal space segment, that is to say, the practical section of communication between modules 31 and 41, is based on a standard data transmission specific, very both guarantees reliable data transfer, eliminates most of the characteristics of the "TCP", because complex and, anyway, useless, and maintains compatibility

Internet environment, as it has been shown more particularly in view of Figure 3b.

According to another feature of the invention, in a preferred embodiment, it uses a special mechanism acknowledgment of data space segment.

This mechanism may be called "negative acknowledgment".

The normal mechanism that can be called "positive acknowledgment", requires that for each data packet correctly received, an acknowledgment is generated

reception.

This mechanism causes losses of time because statistically, a link error rates low, which is the case of the space segment, LA15 Most packages are delivered correctly.

By cons, in accordance with the procedure for receipt of negative type, only incorrect reception is reported.

More accurately, when the recipient whatsoever, detects a timeout in the sequence des20 packets received exceeds a predetermined time interval, a packet warning or signal "NAK" is issued to report that there is a missing packet.

This mechanism requires the presence of a buffer or equivalent, at the transmitter, so as to temporarily store the data which have been issued until a predetermined timeout period is

elapsed ("timeout").

Beyond this period, if the sender does not receive a signal negative acknowledgment or "NAK", it is assumed that the packet memory a30 been correctly received by the recipient.

The corresponding data can be erased.

According to another characteristic, and always in a preferred embodiment, the method of the invention uses a mechanism called "spoofing" or "decoy" put EN35 work in conjunction with the mechanism of negative acknowledgment.

This mechanism avoids the problems of flow limitation due to small size of window on a high capacity link, or "high latency" I5 according to Anglo-Saxon terminology.

By default, the window size of 8096 bytes is standard for most

operating systems of personal computers ("OS").

The maximum size allowed by the current "TCP" is 64 KB (16 bytes in the header of a packet "TCP"), 10 which allows a maximum throughput of 1024 KB / s, if one admits return trip time of 0.5 s for the space segment.

Manufacturers offer software that allows windows whose dimensions, by default, are in the range 8 KB to 24 KB, which allows a flow of 15 from 128 kbits / s to 384 kbits / s.

Bodies in charge of definitions of Internet standards ("the Internet Engineering Task Force") have also proposed amendments to the Protocol "" TCP "(" RFC 1323 - TCP Extensions for High Performance ") that could extend the window size theoriquement20 up "to a maximum of 1.07 GB, which would allow flow also theoretical, 17.12 Gb / s.

However, the increase in flow, under "TCP", is accompanied by an increased risk of packet loss.

The process according to the invention, in its aforementioned embodiment, aims to reduce transmission delays "end

end ", known as the Anglo-Saxon term parameter" Round Trip Time "or" RTT ".

The arrangements above will be

explained with reference to Figure 4

Procedure can be divided into four main phases corresponding.

We will first describe the characteristics of a system architecture for implementing a

mechanism.

The software layers 30 of the remote system forward RH, referenced 32, comprise at least one layer "TCP" 321 and an applications layer 320.

The computer system of the service provider, ISP referenced 'includes extra layers 40 and 41, two buffers, 44 and 45.

Gateway 5 has not been shown in Figure 4.

To better highlight the mechanism, we split the link 11 of Figure 3a in two separate connections: one uplink / downlink liaison10 if and 11r, associated buffers 45 and 44, respectively.

It was also distinguished links "forward - service" and reverse links 134 and

143, respectively.

Similarly, the end-user terminal, referenced SIT ', includes two buffers, 33 and 34, associated with uplinks to the satellite Sat, 12r and

down, 12f, respectively.

The data sent by the remote host to the RH terminal SIT 'link on the 134 are subject to an acknowledgment as soon as they reach the installation service ISP, and they "enter" in the specific module 4.

This provision makes it possible to evade the overall propagation delay, that is to say, the above-mentioned parameter "RTT", the trip delay and26 return on the space segment.

As has been indicated, this delay is the main fraction

"RTT", because of the delay and return of electromagnetic waves to travel the distance "land -

satellite - earth, "is about 0.5 s.

Window variable30 standard is maintained at the service provider ISP, so maintain normal interactions with the

RI is the Internet.

Data in the direction of the user terminal SIT 'are then transferred by the specific protocol, using the buffer 45, to ensure high reliability.

Since the mechanism of negative acknowledgment is used, the service provider ISP, not waiting for a signal of acknowledgment for any final recipient transmettre5 data to the SIT terminal ', which is a gain time sensibve

These data are transmitted to the memory

SIT terminal pad 34 ', via links and 1lf-12f

In the other direction, the data transmitted by the terminal SIT 'for any recipient on the network

RI Internet, for example the forward distance HR are subjected to the application specific layers 3 (half module 31 -

32), then using the specific protocol provider ISP '(half module 40-42), via buffers

33 and 44.

Finally, the data are submitted in a conventional manner module "IP" reside in the system

IT service provider ISP ', to be delivered to the remote host via the Internet HR conventional ground RI, by linking 143.

This, in turn, 2G sends an acknowledgment of receipt by the 134 connection to the service provider ISP.

The user terminal SIT 'must not wait for this acknowledgment to transmit data

additional.

The reliability of data exchange entre25 both entities SIT 'and HR is guaranteed by the mechanism of negative acknowledgment described above.

According to this mechanism, the data exchanged are stored temporarily in buffers, 33 and 34 to the terminal SIT ', and 44 and 45 for service prestataire30 ISP.

If, after a predetermined time interval, either one of these entities has not received a packet alert or "NAK", the data stored in the buffer in question, corresponding to previously sent a packet can be erased.

In cas35 contrary, they are re-issued, a transmission error

being detected in the manner previously described and causes the emission of signal "NAK".

The process according to the invention ensures absolute transparency vis-à-vis other protocols used in transmissions over networks such as the Internet, including the protocol known by the acronym "UDP" (for "User Datagram Protocol").

Indeed, these protocols do not have the same sensitivity to the effects

unwanted broadband connections and long delais 10 It is therefore unnecessary to have recourse to that just described for the "TCP".

Figure 5 illustrates an alternative architecture according to the invention which allows multiplexing and

demultiplexing data traffic between the two protocols.

Side user terminal referenced SIT ", the software module 3" is divided into two sub-modules MI and M2.

The

first module MI, includes application layers 30 and 31-32 of the specific layers 3a or 4.

The second sub-module, M2, includes, in common with the first sousmodule MI, the upper application 30, a protocol layer "UDP" and

layer network address "IP."

In the system service SIT ", we find the same module 4, this module includes specific layers 40-41 and layer network address" IP "42.

The latter shall, as before, with the layer network address "IP", referenced 54 "a

gateway 5 ", via a bus 42 and any drivers (not shown).

Module 4 and the sub-module MI communicate with each other via the space segment, labeled S $.

Shows

links "Earth - satellite - earth" by a bidirectional single S $ a.

Gateway 5 "includes a driver connected to the Internet via the main artery RI 12.

The layer network address "IP" 54 "of the gateway 5" is connected to the sub-module M2 also by the space segment SI, and more precisely by a bidirectional Slb.

So there are two paths parallel data transmission, taking both the space segment, between the service provider ISP "and the user terminal SIT" .10 However, the transmitted data are treated differently according to the protocol used at of the

transport layer.

Since data packets include in the protocol fields, information indicating which transport protocol is used, "TCP" or "UDP" in the example described, the data streams can be

demultiplexed (meaning HR SIT ") or multiplexed (SIT meaning" to RH) by the layer network address "IP" 54 "in the module 5" (Gateway) service provider ISP. "

In other words, data in transport protocol "UDP" is transmitted directly from the service provider ISP "terminal SIT" or vice versa, by linking Slb, as they would have been if the specific process modules the invention were not implanlés.25 They also not pass these modules.

For this type of transmission, as transport protocol "UDP"

the architecture of the system is, in itself, quite similar to an architecture according to the prior art, such as described with respect to Figure 2.

By cons, regarding the data transmitted in "TCP", the path is very

is similar to that described with reference to Figures 3a and 4, once the demultiplexing process took place in the layer 54 ".

SIT in the terminal, "there is no demultiplexing or multiplexing also to itself.

The data transmitted by the service provider ISP "arrive according to two distinct la5 application layer 30.

Conversely, if is the application layer 30 which transmits the data directly to the issue either way: submodule M for the transport protocol "TCP" or submodule M2 for

transport protocol "UDP".

Multiplexing is systematic RI to the Internet via the main road 12, that is to say,

output layer network address "IP" 54 ", since all data, regardless of the transport protocol used, the same path on the network.

In summary, a logical point of view, some of the logical layers of the user terminal SIT "are

installed in the system service provider ISP. "

Naturally layer network address "IP" on the terminal SIT "I, but physically located in LE20 ISP system" is characterized by the same address as the one in the terminal SIT ".

A reading of the foregoing, it is readily apparent that the invention achieves the goals it has set.

It brings many benefits, including the following: It first allows better control of the data stream, and a more efficient management

Decoupling network segment space to significant delay and the rest of the Internet, that is to say, LE30 classical terrestrial network allows indeed a very significant improvement of the control and data flow management mechanisms congestion.

This is because reducing the time from start to finish, made by management mechanisms specific to the invention makes these

more effective mechanisms and provides a faster response.

This provision responds to the needs of the most delicate poses a changing environment as inhomogeneous and that can be a network such as the Internet

The invention also allows a significant decrease in transmission links with additional satellites.

Indeed, for each data segment "TCP", a minimum of 40 bytes is added to the data that can be described as "useful".

Of10 these 40 bytes, 20 bytes are the header "IP" necessary to address and 20 bytes is the header "TCP".

As has been mentioned, the new version of the protocol, "IPv6" address space allows more

important, which requires a header more long.15 Since data transfers on the space segment are based on protocol type "owner", the en-

extra headers "TCP" and "IP" are no longer necessary, thereby increasing the efficiency of data packets.

Traffic is reduced on the space segment.

Indeed, traffic control on satellite links is limited to trade normally existing between layers "TCP" and application layers.

Data segments "TCP" conveying important headers "IP" and25 "TCP" for orders data management and management of connections are avoided on routes

Satellite telecommunication

The invention also allows a connection opening time limited, on both sides.

According to an important feature of the invention, the interface "TCP" has been moved and is now located directly on the Internet itself (ground segment).

This

arrangement eliminates the problems related to the system called "slow start".

The invention also reduces the memory resources required on the user side.

This is due to the implementation of acknowledgment mechanism called "negative."

Needs transmission buffer are significantly reduced compared to a "TCP-to-TCP" classic prior art.

Indeed, in the case of a loss of a data packet, a signal "NAK",

for data transmitted on the reverse link, is returned to the service provider within a predetermined fixed time interval.

In a system according to the prior art, the module "TCP" stores the transmitted packets until it receives an acknowledgment of

reception said "positive" or "ACK".

The time until reception is extremely variable

This is due to the changing nature environment characterizing the réseau15 Internet.

All packets transmitted must be stored until it receives acknowledgments for them.

For these reasons, while a conventional system requires memory reaources large enough to accommodate situations plus20 extreme, that is to say, a signal "ACK" is received after a very long time, the invention for its part requires only

buffer minimum, since the required size is still set to a low value, a direct function of said fixed time interval.

As has been shown, the process of the invention can be made completely "transparent" for

protocols other than the transport protocol "TCP", including the protocol "UDP".

Finally, the invention maintains compatibility end

end with the Internet environment.

It should be clear that the invention is not limited to the embodiments explicitly

described, particularly in relation to Figures 3a-5.

In particular, the transport protocol, called the "owner" for data transmissions on the links of the space segment (satellite earth - earth) is not limited to a single protocol based on seul5 standard data transmission known " DVB-S "above, even if it is particularly suitable for such bonds.

Other standard data transmission can be implemented without departing from the scope of the invention.

In fact, because of the particular cutting DES10 modules "TCP" user terminals into two "horns" on the ends of the space segment, the latter a logical point of view, is "invisible"

rest of the Internet.

The numerical values that were specified to fix ideas.

They are mainly related to the current status of standardization (version) protocol

transport "TCP".

Finally, in an alternative embodiment not described, we can design a network with multiple spatial sections, for example to connect two user terminals through the Internet, each

being connected to a service provider via satellites separately.

Notice

Claims FR2778804

CLAIMS

1.

Method for transmitting data between at least one user terminal (SIT) and a first said computer system remote host (RH), under protocol such as the Internet, via a network including a ground segment (RI) and at least one space segment consists of a bidirectional link (11, 12) by telecommunication satellite (Sat) which is connected to said terminal (SIT), said terrestrial segment (RI) and space are interconnected by a second computer system, said service provider (ISP), characterized in that, the transmission being associated with a stack of protocol layers, each layer by contacting interfaces with the layers which are immediately above and below, and said stack comprising at least one layer upper software applications (30), a first intermediate layer immediately below, so-called transport type, "TCP", and a second intermediate layer, said addressing network "IP" type, the method comprises: - the distribution of said layer "TCP" of each user terminal in two half modules so that they each comprise a transport layer "(TCP" 25 (31, 41) and a specific interface layer (32 , 40), - the location of said half-modules at the ends of said space segment, a first half-module being located in said computer system a service provider (ISP) and a second half-module being installed in the user terminal (SIT) - the extension of the network layer address of "IP" on the user terminal (SIT) in the computer system service provider (ISP), - the data on said bidirectional link (11, 12) using a transport protocol based on internal transmission mode specific data, - the bidirectional conversion between said Internet type protocol and said internal protocol by said specific layer (40, 32) of the first and second demimodules, - and the realization of an interface between said transport layer (31) of the second half-module and a layer

application software (30) installed in the user terminal.

2.

A method according to claim 1, characterized in that said transmission mode specific data on said bidirectional link (11, 12) by telecommunication satellite (Sat) is the transmission standard

digital video signals of the type "DVB-S".

3.

A method according to claim 1, characterized in that said user terminals (SIT ") and said remote host (RH") can be transmitting and / or receiving data packets, it implements a procedure for acknowledgment of receiving comprising the steps of: - for each transmission of a data packet, from a transmitter to a receiver, the transmitter by the storage of a copy of said data packet, - transmission by said recipient of a packet an alarm indicating missing data packet issued upon detection of a timeout in receiving a sequence of data packets exceeding a predetermined timeout period, - the conditional retransmitting said data packet stored in the reception transmitter of said alert packet - or erasing said data packet after

the flow of said delay period.

4.

A method according to claim 3, characterized in that the transmission of data packets from said remote host (RH) to one of said user terminals (SIT ") comprises the steps of: - transmission by the remote host (RH) of a data packet, - the generation of an acknowledgment of receipt by said service provider (SIT ') upon receipt of said data packet by said first half-module, and transmitting the acknowledgment to said remote host, and - transmitting said data packet to the user terminal (SIT ") by operating said

internal protocol, via the first and second half-

modules.

5. A method according to claim 3, characterized in that the transmission of data packets of one of said user terminals (SIT ") to said remote host (RH) comprises the steps of: - submitting a data packet said application software layer (30) of the data terminal to the first half-module and transmitting said data packet to said service provider (ISP ') by operating said internal protocol of said bidirectional link (L1F, 12f , 11r, 12r) of the space segment via the second half-module; - subjecting said data packet with a layer network address "IP" (42) of the service provider (ISP ') to said ground segment of the network Internet (RI), for transmission to the remote host (RH) at said Internet Protocol type, and - generating an acknowledgment of receipt by the remote host (RH), upon receiving the data packet

destination servibe provider (ISP ").

6.

A method according to any one of claims-

ing claims, characterized in that said network (RI) carrying streams of data in said transport protocol "TCP" and at least a second transport protocol, the transmission of waves of data from said remote host (HR) to one said user terminals (SIT ") comprises the steps of: - demultiplexing said data streams transmitted by the remote host (RH) with a layer network address" IP "(54") of said service provider (SIT ") - the transmission of said data streams demultiplexed under transport protocol" TCP ", to the user terminal (SIT") via a first bidirectional transmission link (Sla) space segment using said protocol internally via the first and second half-modules, and - the direct transmission of said data streams demultiplexed, in said second transport protocol, to the user terminal (SIT ") via a second bidirectional transmission link (Slb) space segment employing the second protocol and specific layers (M2) of the protocol, implemented in the user terminal (SIT ") and having an interface with said layer

software applications (30).

7.

A method according to claim 6, characterized in that the transmission of data streams from one of said user terminals (SIT ") to said remote host (RH) comprises the steps of: - subjecting said data selectively by layer software applications (30) in the second half-module (M) when the data must be transmitted in transport protocol "TCP" or T to specific layers (M2) said second transport protocol when data must be transmitted in this Protocol - transmission of said data under "TCP" to said service provider (ISP "), via said first link (Sla) the space segment and the first and second half-modules - direct transmission of said data in the second protocol to said service provider via said second connection (SLG) space segment - the multiplexing of data in the two protocols by a layer network addressing "Ip" (54 ") service provider (ISP") - the submission of data and multiplexed by said layer network address "IP" (54 "), said segment terrestrial Internet network (RI) for transmission

the remote host (RH).

8.

Process according to claims 6 or 7,

characterized in that said second protocol

transport protocol "UDP".

9.

Architecture for the implementation

the method according to any one of claims

preceding characterized in that said user terminals (SIT) comprise a layer of software applications (30), in that the user terminals (SIT) and the computer system of said service provider (ISP) each comprise half a module in which are located a transport layer "TCP" (31, 41) and a specific layer interface (32, 40) with said bidirectional transmission link (11, 12) by telecommunication satellite (Sat) and providing a bi-directional conversion between said transport protocol "TCP" and said internal protocol, and in that the computer system of the service provider (ISP) further comprises a layer of network addressing "IP" (42), relative the network addresses of the terminal

User (SIT).

10.

Computer architecture according to claim 9, characterized in that said bidirectional link by telecommunication satellite comprises a forward channel (/ If, 12f) and a return path (11r, 12r) between said user terminals (SIT ') and the system said computing service provider (ISP), and in that said system (PSI ') and terminals (SIT') each comprise two buffers (44-45, 33-34), respectively associated with the way to go (/ If , L2F) and return (11r, 12r).

11.

Computer architecture as claimed in claims

tions 9 or 10, characterized in that the system of said service provider (ISP) further comprises a bridge (5), disposed between said first half-module and said ground segment of the network (RI) and in that said gateway (5) comprises at least one layer of network addressing "IP" (54) relative to the service provider (ISP) and an interface layer (53) said driver

network management.

12.

Computer architecture as claimed in claims

tions 11, characterized in that said network (RI) carrying data streams in said transport protocol "TCP" and at least a second transport protocol, said user terminals (SIT ") comprise a stack of layers (M2) comprising at least one layer of network addressing "IP" (36) and a transport layer (35) specific to said second protocol layer in communication with said software application (30), in that said space segment includes first (SIs) and a second (SLb) links bidirectional transmission of data, the first link (SIs) providing transmission in said internal protocol and the second link (SLb) under said second protocol, and that the computer system of that service provider (ISP ") comprises demultiplexing means (54") of data streams received from said remote host (RH), conveyed in one or the other of said two protocols to transmit selectively to said terminals User (SIT "} streams data in the transport protocol" TCP "half-via said first module, said first link (SIs) and said second half-module, and data streams in the second transport protocol via said second link

(SLb) and said stack layer (M2).

13.

Computer architecture according to claim 12, characterized in that the computer system of said service provider (SIT ") comprises multiplexing means (54 ") of data streams received from said user terminals (SIT") conveyed in said protocol transport "TCP" or said second transport protocol, to a stream of data transmitted to said remote host (RH) via said gateway (5) and said segment

land (RI).

14.

Computer architecture as claimed in claims

tion 12 or 13, characterized in that said stack (M2) comprises at least one transport layer "UDP" (35)

and a layer of network addressing "IP" (36).

15.

Computer architecture as claimed in any

of claims 12 to 14, characterized in that said

and multiplexing means for multiplexing said layer are formed by network address "IP" (54 ") of

said bridge (5).

FIG_1

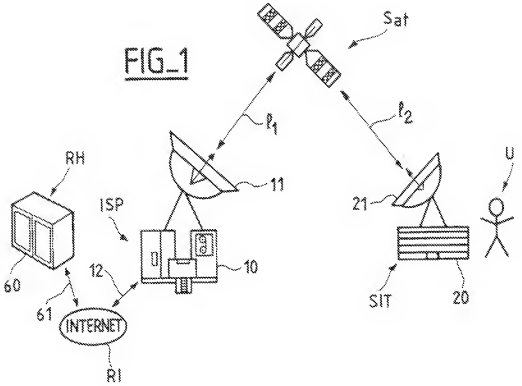

Sat
ℓ_1
ℓ_2
RH
ISP
11
21
U
60
12
10
61
INTERNET
SIT
20
RI

FIG_2

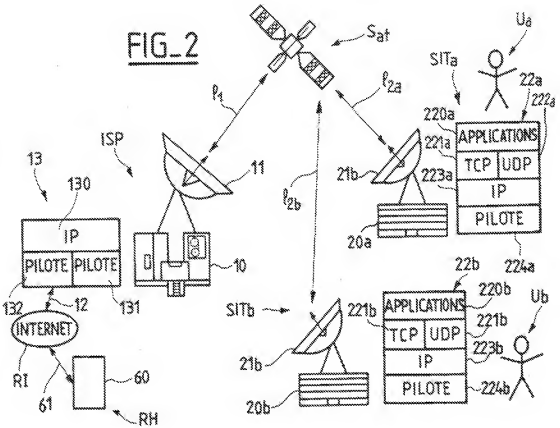

Sat
Ua
SITa
22a
222a
ℓ_1
ℓ_{2a}
220a
221a
APPLICATIONS
TCP
UDP
IP
PILOTE
ISP
13
130
11
21b
223a
ℓ_{2b}
IP
PILOTE
PILOTE
10
20a
224a
22b
220b
Ub
132
12
131
SITb
221b
APPLICATIONS
INTERNET
TCP
UDP
221b
21b
223b
RI
60
IP
20b
224b
61
PILOTE
RH

FIG_3a

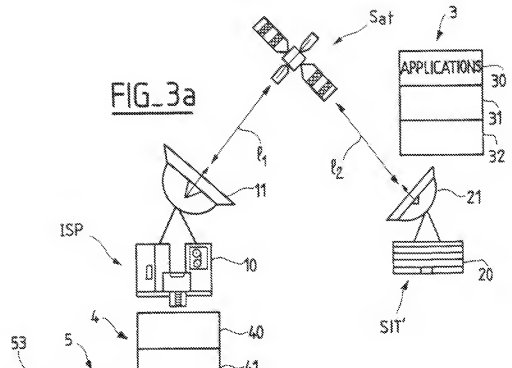

Sat
3
APPLICATIONS
30
31
32
ℓ_1
ℓ_2
11
21
ISP
10
20
SIT'
4
40
41
42
53
5
PILOTE
IP
IP
RI
12
INTERNET
54
420
61
60
RH

FIG_4

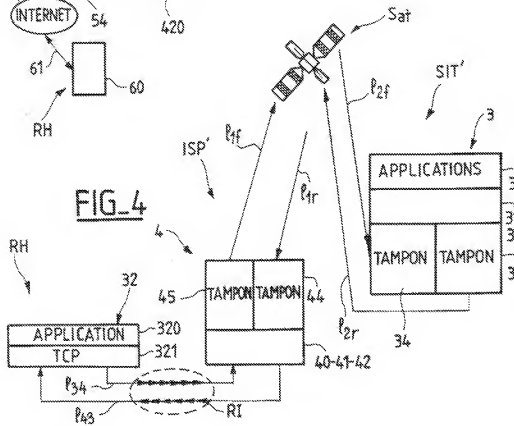

Sat
SIT'
ℓ_{2f}
3
APPLICATIONS
30
31
32
TAMPON
TAMPON
33
34
ℓ_{1f}
ISP'
ℓ_{1r}
4
RH
32
45
TAMPON
TAMPON
44
APPLICATION
320
TCP
321
ℓ_{2r}
40-41-42
ℓ_{34}
ℓ_{43}
RI

FIG_5

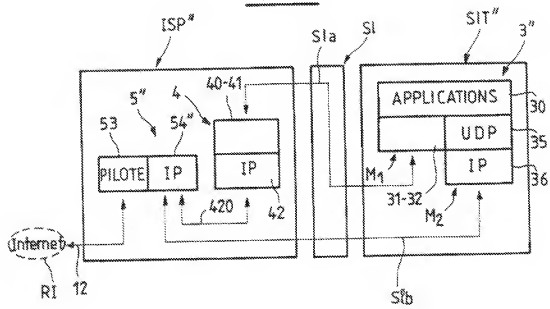
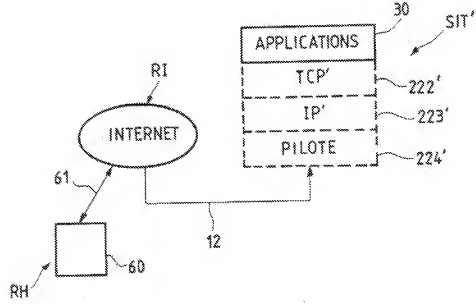

ISP"
SIa
SI
SIT"
3"
5"
4
40-41
53
54"
APPLICATIONS
30
UDP
35
PILOTE
IP
IP
IP
36
M1
31-32
M2
420
42
Internet
RI
12
SIb

FIG_3b


30
SIT'
APPLICATIONS
RI
TCP'
222'
INTERNET
IP'
223'
PILOTE
224'
61
12
60
RH